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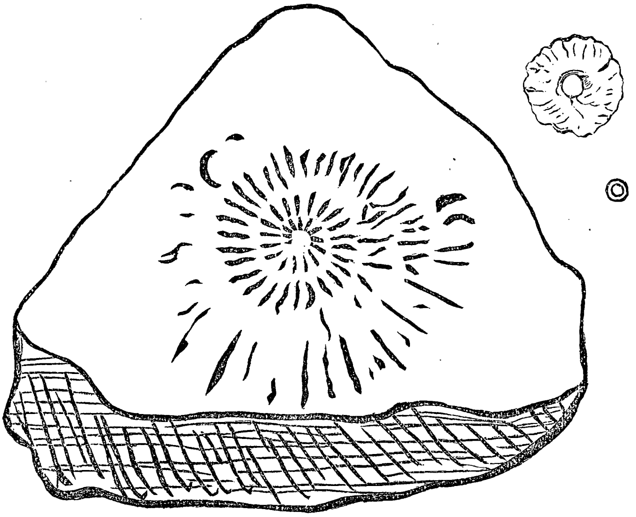
especially those of the north-west, the Germans preponderate. ——M. Lessup has written to the Russian Geographical Society that he has explored the Ongouz river, which was previously known only in the upper parts. Even the Tekkes did not know the route to the east of Mirza-chile.

GEOLOGY AND PALÆONTOLOGY.

THE POWER OF MOTION IN CRINOID STEMS.—At the Soldiers' Home, near Dayton, Ohio, I found the stone here figured. Imbedded on its upper surface lay a coil of crinoid joints in such a way as to indicate that they had all once formed part of the same crinoid stem. Indeed, the former unity of the first 2½ coils is evident; but here we find traces of two coils, and a little farther out is seen a half coil of larger beads, however the parallelism of the coils would indicate that these are only parts of the same stem, the intermediate parts having been removed and their connection broken.



Coil of Crinoid Joints.

The stone is of the Clinton group, but I cannot determine the species of the crinoid; although separate joints of the stem are extremely common, the crinoid heads are lacking. One thing is remarkable, the rapid increase in size of the joints of the column within 2½ coils, or not quite three inches, from $\frac{1}{16}$ of an inch to about four times this diameter. I figure the end disks, enlarged two diameters.

The column is disposed in a perfect and natural coil. It is not customary to find things so arranged in nature unless it is either a law of their growth or the objects have the power of volition and can place themselves in such a position at will. The first case is not true here, because I frequently find a few continuous joints which do not show this coiled arrangement. It cannot be mere accident, since it is almost mathematically perfect, and any agency at work upon the animal after death, such as the rotary movement of water in a whirlpool, or the play of animals, might have twisted the crinoid about, but would not have formed a coil such as this. Hence, I conclude that it must have had the power of placing itself in this position at will, and that it was destroyed at a time when it had so disposed itself. The power of assuming the shape of a coil is quite a complex one, and necessitates a system of muscles capable of slight contraction along the whole extent of the column, and is generally correlated with power of motion in any direction, as in the bodies of snakes and the necks of swans.

So we may conceive the head of our crinoid as attached to this column and through it to some object on the bottom of the ocean ; but it is not a flower dangling on its stem, dependent on the capricious flow of water and the accidental presence of animalcules for its food, but we may picture it as moving about in all directions, limited indeed by the length of its column, and thus securing its food. I have been quite lengthy in my description, but this may be excused if I have convinced my geological friends on this subject.—*Aug. F. Foerste, Dayton, Ohio.*

THE LOUP FORK BEDS ON THE GILA RIVER.—In his report on the Geology of New Mexico, to the Secretary of the Interior, by Dr. F. V. Hayden, in 1869, this eminent geologist described the Santa Fé marls in their principal physical features. In 1874, in my report to Capt. Geo. M. Wheeler, U. S. Engineers, I showed that this formation is a member of the Loup Fork division of the Miocene Tertiary, a conclusion clearly deducible from the remains of Vertebrata which it contains. An illustrated report on the latter was published in the fourth volume of the Report of the U. S. Geographical and Geological Survey W. of the 100th meridian, Capt G. M. Wheeler in charge (1877).

Since that time the writer has made several visits to parts of New Mexico not previously explored, and I am able to show that the Loup Fork formation has a much wider distribution in that territory than has hitherto been supposed to be the case.

In descending the Rio Grande, beds appear on the west side of the river, which strongly resemble those of Santa Fé. They extend along the eastern base of the Magdalena mountains, and as far south as Socorro, in considerable extent and thickness. South of Socorro they appear, but less extensively. The eastern part of the plain which lies between the Rio Grande and Mimbres mountains is composed of beds of this age where cut by the grade of the Atchison, Topeka and Santa Fé R. R. west of Hatch station. West of the Mimbres mountains the valley of the river of the same name is filled with débris of the bed of eruptive outflow which once covered the country as far as traversed by the railroad from Deming to Silver City. Its age I could not ascertain.

A great display of the Loup Fork formation is seen in the drainage basins of the heads of the Gila river. In traveling westward from Silver City, its beds first appear in the valley of Mangus creek, which enters the Gila from the east. Crossing the Gila, the mail route to the west passes through the valley of Duck creek, which flows eastwards into that river. Though bounded by eruptive hills and mountains, and their outflows, the valley was once filled with Loup Fork beds, which have been extensively eroded, the principal exposures being on the north side of the valley, forming the foothills of the Mogollon range. On the divide between the waters of the Gila and San Francisco rivers, the formation rises in bluffs of 300 feet elevation. The descent into the valley of the San Francisco brings to light a still greater depth of this deposit. The valley, which extends from the cañon which encloses the river south from the mouth of Dry creek, to the Tulerosa mountains on the north, and between the Mogollons on the east and the San Francisco range on the west, was once filled with the deposit of a Loup Fork lake. This mass has been reduced by the erosive action of the San Francisco and its drainage, to a greater or less extent, as it has been protected by basaltic outflows or not. When so protected, the river flows through comparatively narrow cañons. Where the outflow is wanting, the valley of the river is wider, and the Loup Fork formation remains as wide grassy mesas which extend to the feet of the mountain ranges.

The age of these beds would have remained problematical but for the fortunate discovery, by Mr. Robert Seip, of the skull of a species of rhinoceros of the typical Loup Fork genus Aphelops. It is apparently the *A. fossiger* Cope, a species abundant in the Loup Fork beds of Kansas and Nebraska. It was found near the mouth of Dry creek, in a conglomerate bed of the formation.

In the valley of the San Francisco, the Loup Fork beds reach a thickness of 500 feet, and consist of sand, clayey sand, soft sandstone and conglomerates of larger and smaller pebbles of eruptive material, having a near resemblance to those of the region of Santa Fé.—*E. D. Cope.*

ON NEW LEMUROIDS FROM THE PUERCO FORMATION.—The animals of the Eocene period, of the Adapidæ, may belong to the Lemuroidea, but the evidence which I have derived from the feet of Pelycodus[1] has led me to refer them[2] to the insectivorous division of the Bunotheria, to the neighborhood of the Tupæidæ and Erinaceidæ. At the same time I retained provisionally the gen-

[1] Report of U. S. G. G. Survey W. of 100th mer., G. M. Wheeler, IV, p. 140.

[2] Proceedings Academy Nat. Sciences of Philada., 1883, pp. 78–80.

era with three and two superior premolars in the sub-order Lemuroidea, although the foot structure of these extinct genera is yet unknown. I also inadvertently defined the Lemuroidea as having quadrituberculate superior molars, a character which I well knew to be wanting in various extinct and recent genera where they are tritubercular. Two families were proposed for the Eocene lemuroids, which are defined as follows:

Superior premolars three...*Mixodectidæ.*
Superior premolars two..*Anaptomorphidæ.*

The genera of the first named family are defined as follows:

I. Canine teeth large and lateral; well separated.

First superior premolar without internal lobe; superior true molars tritubercular with cingula..*Tricentes.*

II. Canine teeth median in position or much reduced in size.

a. Last inferior premolar without internal tubercle.

Inferior premolars all one-rooted. Canine and incisor small..........*Necrolemur.*[1]
First premolar only one-rooted; canine small; incisor very large.......*Mixodectes.*[2]

aa. Last inferior premolar with internal tubercle.

A very large ? canine; first premolar only one-rooted...............*Microsyops.*[3]
A very large ? canine; first and second premolars both one-rooted...*Cynodontomys.*[4]

The new genus Tricentes includes three species, and perhaps four. These are *T. crassicollidens* Cope, *T. bucculentus* (*Mioclænus* Cope), *T. inæquidens* Cope, and *T. subtrigonus* (*Mioclænus* Cope). These species are all represented by more or less complete crania, and are fully described in the Proceedings Amer. Philos. Society for December, 1883. They all have the orbit open behind.

The genera of Anaptomorphidæ, which on dental characters includes Indrodon, differ as follows:

a. Incisors three.

First superior premolar without inner lobe; posterior inner tubercle present on first and second superior true molars..................................*Indrodon.*

aa. Incisors two.

First superior premolar with inner lobe; no posterior inner tubercle on superior molars..*Anaptomorphus.*

The superior dental formula of Indrodon is I.,^{3}; C.,^{1}; P-m.,^{2}; M.,^{3}. The canine is compressed and acute; the third premolar is compressed conic, and has two roots; the fourth premolar has but one external cusp. The external cusps of the true molars are conic and acute, and are connected with the internal cusp by ridges which form a V. Posterior inner cusp distinct on Ms. I and II, a part of the posterior cingulum. Intermediate tubercles present, small. The superior incisors are well developed and display no tendency towards the rodent type. A portion of lower jaw adheres to the skull, and may belong to the same animal. It supports the last two molars. These have two anterior, opposite, approximated cusps. The heel of the penultimate molar is rather large, and has a raised edge, which develops two tubercles at the angles.

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[1] Filhol Rech. Phosph. Quercy.

[2] Proceedings American Philos. Society, 1883, p. 559.

[3] Leidy, Report U. S. Geol. Survey Terr., I.

[4] Cope, Pal. Bull., No. 34.

Indrodon malaris, sp. nov.—*Char. Specif.*—The first and third superior incisors are a little larger than the second. Canine preceded and followed by diastemata, each of which is 1.5 times as long as the long diameter of the base of the crown. Premolars separated from each other and from the first true molars by interspaces half as long as the diastemata. Neither tooth has any basal tubercles, but the posterior has a weak external cingulum, which is stronger posteriorly. The internal cusp of the same tooth is anterior, and is acute and elevated. The superior true molars have a strong external cingulum, which rises into a small tubercle opposite the space between the external principal cusps. Of the latter the anterior is a little more conic than the posterior, and both are well within the external border. On the last molar the posterior external cusp is continuous with the external intermediate tubercle, and forms a cutting edge within the posterior margin of the crown. The posterior inner tubercle is rather large, and projects further inwards than the apex of the anterior V or the second true molar, but not so far as in the species of Anisonchus and Haploconus.

The surface of the cranium is too much obscured by cracks and films of matrix to permit a view of the sutures and foramina. The face is wide, as the posterior part of the maxillary and the malar bones are expanded outwards. I have not yet been able to ascertain the condition of the orbit posteriorly. The mandibular ramus is rather slender.

MEASUREMENTS.		M.
Length of dental series from posterior base of I III		.0248
Length of bases of superior incisors		.0060
Length of premolars on maxillary bone		.0060
Length of base of Pm. IV		.0028
Width do.		.0038
Diameters M. II	anteroposterior	.0033
	transverse	.0040
Diameters inferior M. II	anteroposterior	.0032
	transverse	.0030
Depth of ramus mandibuli at M. II		.0070

The skull is about the size of that of the *Bassaris astuta*. New Mexico; D. Baldwin discoverer.

The discovery of this type in the Puerco formation is a fact of interest. In the shortening of its dental series it is the most specialized genus of the epoch, while the forms of its true molars are like those of the simple Creodonta, and more specialized than those of Anaptomorphus and the lemurs generally. In the simplicity of its premolars, however, it maintains the general character of the Puerco fauna, and is more primitive than the forms just named. Its nearest ally of the Puerco yet known is Chriacus.—*E. D. Cope.*

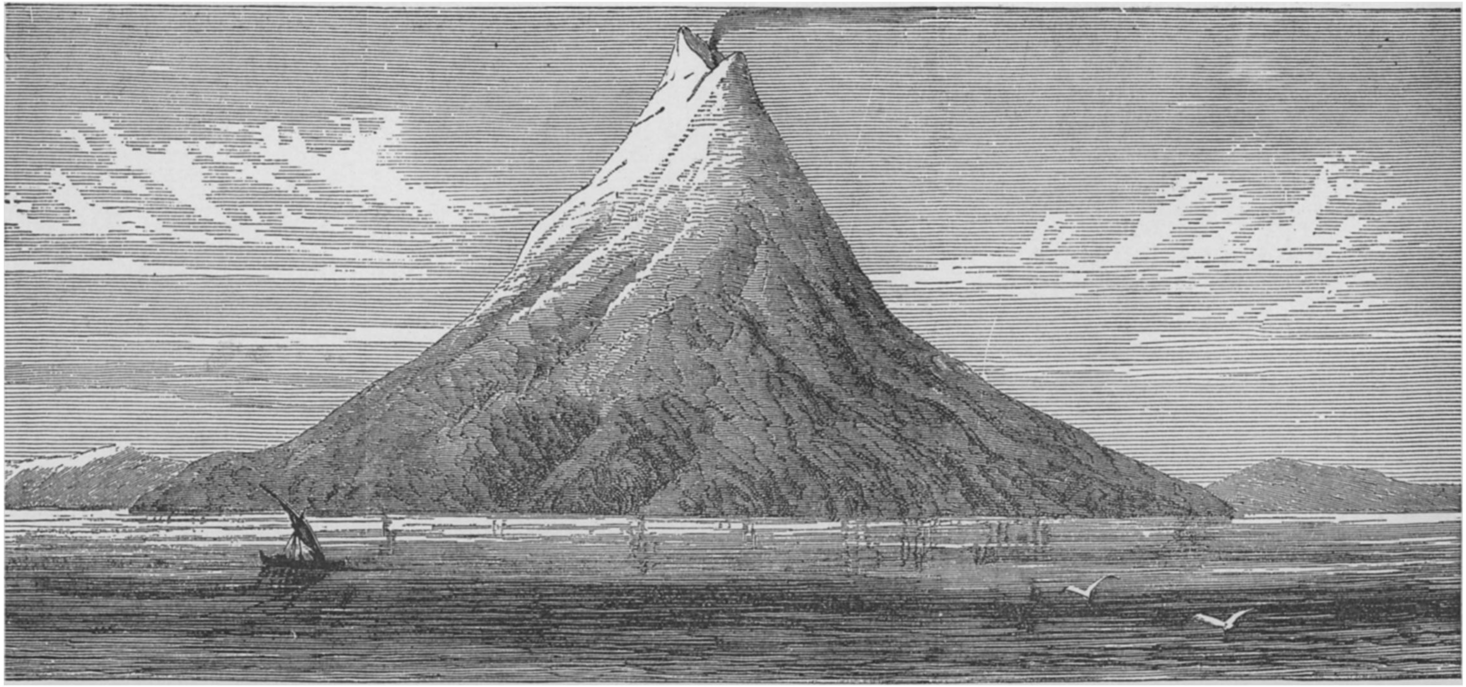
THE DESTRUCTION OF THE VOLCANO OF KRAKATOA.—It now appears that this volcano was not wholly destroyed during the great eruption on August 26th, a portion of its southern aspect still remaining. How it appeared before the catastrophe may be seen in the accompanying illustration from the *Scientific American. Nature* for Oct. 25 prints several communications respecting the great earthquake wave which was felt at Aden, Cape of Good Hope, and the Mauritius. Farther facts of much interest appear in *Nature* for Nov. 8. It seems that on May 22, 1883, Krakatoa was in a state of eruption, sending out showers of ashes and streams of pumice. The activity continued during June and July.

HUNTING FOR LOST GLACIERS WITH A MICROSCOPE.—Considerable work has been done in this direction in Germany and elsewhere, by various observers, work with which geologists are more or less familiar, and Dr. E. Geinitz gives the results of an extended study of the plagioclase rocks and phonolites of the Mechlenburg drift.

The method consists in examining thin sections of the rocks found in the drift, and comparing them with the descriptions given by the Scandinavian lithologists of rocks known *in situ* in that peninsula. In this way various basalts, diabases, gabbros, diorites and phonolites are referred to certain localities in Sweden, whence they are supposed to have been derived. Interesting results can be obtained by such methods, but they are often uncertain, since it cannot be predicted that rocks of the same character do not exist, or have not existed, in the intermediate drift or water-covered areas.—*Journal of R. Microscopical Society.*

GEOLOGICAL NOTES.—*General.*— Professor T. R. Jones, in a report presented to the British Association at its last meeting, gave a synopsis of the fossil Phyllopoda. He recognizes thirty genera, of which seventeen occur in Great Britain.——Mr. Hy. Woodward (*Geol. Mag.*, Oct.) commences a synopsis of the genera and species of carboniferous limestone trilobites. The first paper is almost entirely occupied with the genus Phillipsia, eight species of which are diagnosed. *P. laticaudata* is new, as is also a species referred provisionally to Proetus, under the title of *P. levis.* The second paper (Nov.) diagnoses nine species of Griffithsides, one of which is new.——The Transactions of the Royal Dublin Society contain a monograph of the fossil fishes of the Carboniferous series of Great Britain. Following the intentions

PLATE VII



The Volcano of Krakatoa, Straits of Sunda; height, 2700 feet.

of Agassiz, as far as they can be detected by his MS. labels, fifty-nine genera and 163 species are recorded, of which 117 have been obtained at Armagh, Ireland. Fourteen of the genera are founded on the spines of Hybodonts, four generic names denote various peculiar cranial bones and dermal plates, the true anatomical relations of which are as yet unknown, and forty-one are founded on the various forms of teeth of the types Orodus, Petalodus, Cochliodus, Psammodus and Copodus. Mr. Davis states that, judging from analogy, the teeth of Cladodus may have been associated with the spines of Ctenacanthus. The spines of Oracanthus are stated to have probably occupied a lateral position on the head of these elasmobranchs. The worn condition of their apices proves that they were not dorsal, while their solid points, decorated on both sides, show that they were not true dermal plates.

Tertiary.—Mr. Newton (*Geol. Mag.*, October) records the occurrence of the cave hyæna, which, with Professor Boyd Dawkins, he regards as a large variety of *H. crocuta*, in the "Forest Bed" strata of Suffolk, England.

Quaternary.—The alluvial deposits of the Kashmir district are stated by Mr. R. Lydekker to be of vast and varied extent and composition. The town of Kishtwar, in the Chinab valley, is built on one of these deposits, at a level of several hundred feet above the river. The presence of fine clayey and sandy horizontal layers in the valleys, at considerable elevations above the bottom of the valley, prove that a dam once existed lower down the valley, and Mr. Drew has estimated that the great lake of Kashmir must once have stood 2000 feet above the present level of the valley.

MINERALOGY[1].

American Gems and Precious Stones.—Mr. Geo. F. Kunz has contributed to "The Mineral Resources of the United States," published by the Government, an article on American gems and precious stones, of which separate copies have been printed. Mr. Kunz has for some years been connected with Messrs. Tiffany and Co., the well known jewelers of New York city, and has had an excellent opportunity for collecting facts concerning American gems.

He states that systematic mining for gems and precious stones is being carried on at only two places in the United States, viz., Paris, Maine, and Stony Point, North Carolina. In other cases where gems are found they are either met with accidentally, or occur in connection with other materials that are being mined, or in small veins which are only occasionally met with. They are often gathered with little system on the surface, as is the case with

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[1] Edited by Professor H. Carvill Lewis, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.